9th Class 2019		
Chemistry	Group-I	Paper-I
Time: 1.45 Hours	(Subjective Type)	Marks: 48

(Part-I)

Q.2. Write short answers to any Five (5) questions: 10

(i) Define empirical formula with an example.

Ans **Empirical formula:**

Empirical formula is the simplest whole number ratio of atoms present in a compound. The empirical formula of a compound is determined by knowing the percentage composition of a compound.

Example:

The covalent compound silica (sand) has simplest ratio of 1:2 of silicon and oxygen, respectively. Therefore, its empirical formula is SiO_2. Similarly, glucose has simplest ratio 1:2:1 of carbon, hydrogen and oxygen, respectively. Hence its empirical formula is CH_2O.

(ii) Give symbols of arsenic and silver.

Ans Symbols of arsenic and silver are As and Ag, respectively.

(iii) Differentiate between cation and anion.

Ans **Differences between Cation and Anion**

	Cation		Anion
1.	An atom or group of atoms having positive charge on it, is called cation.	1.	An atom or a group of atoms that has a negative charge on it, is called anion.
2.	The cations are formed when an atom loses electrons from its outermost shells.	2.	Anion is formed by the gain or addition of electrons to an atom.
3.	For example, Na^+, K^+ are cations.	3.	For example, Cl^- and O^{2-} are anions.

(iv) What do you mean by plum pudding theory?

Ans 'Plum pudding theory' was put forth by J.J. Thomson. According to this theory, the atoms are solid structures of positively charged particles with tiny negative particles stuck inside. It is like plums in the pudding.

(v) Define isotopes and give an example.

Ans Isotopes are defined as the atoms of an element that have same atomic number but different mass numbers. For example, protium ($_{1}^{1}H$), deuterium ($_{1}^{2}H$, or D) and tritium ($_{1}^{3}H$, T) are the isotopes of hydrogen.

(vi) Define Dobereiner's triads.

Ans A German chemist Dobereiner observed relationship between atomic masses of several groups of three elements called triads. In these groups, the central or middle element had atomic mass average of the other two elements. One triad group example is that of calcium (40), strontium (88) and barium (137). The atomic mass of strontium is the average of the atomic masses of calcium and barium.

(vii) What is meant by Shielding effect?

Ans The attraction of the nucleus on the electrons of outermost shell is reduced. As a result, an atom experiences less nuclear charge than that of the actual charge. It means that the electrons present in the filled energy levels screen or shield the force of attraction of nucleus felt by the valence shell electrons. This is called as 'shielding effect'.

(viii) Why are noble gases not reactive?

Ans The noble gases have 2 or 8 electrons in their valence shells. It means all the noble gases have their valence shells completely filled. Their atoms do not have vacant space in their valence shell to accommodate extra electrons. Therefore, noble gases do not gain, lose or share electrons. That is why, they are non-reactive.

Q.3. Write short answers to any FIVE (5) questions: 10

(i) Define duplet rule and octet rule.

Ans Having 2 or 8 electrons in the valence shell is sign of stability. Attaining two electrons in the valence shell is called duplet rule while attaining eight electrons in the valence shell is called octet rule.

(ii) Write any two properties of ionic compounds.

Ans The ionic compounds have following two properties:

1. Ionic compounds are mostly crystalline solids.
2. Ionic compounds in solid state have negligible electrical conductance but they are good conductors in solution and in the molten form. It is due to presence of free ions in them.

(iii) What do you mean by malleability?

Ans Malleability is the property by virtue of which a metal can be drawn into sheets.

(iv) Define standard atmospheric pressure. Also write its unit.

Ans **Standard atmospheric pressure:**

It is the pressure exerted by the atmosphere at the sea level. It is defined as the pressure exerted by a mercury column of 760 mm height at sea level. It is sufficient pressure to support a column of mercury 760 mm in height at sea level.

1 atm = 760 mm of Hg = 760 torr (1 mm of Hg = one torr)
= 101325 Nm^{-2} = 101325 Pa

(v) Convert – 30°C to K unit.

Ans

$(T)^{\circ}C = -30^{\circ}C, \quad (T)K = ?$

$(T)\,K = (T)^{\circ}C + 273$

$(T)\,K = -30^{\circ}C + 273$

$(T)\,K = 243\ K$

(vi) Give two examples of suspension.

Ans Example of suspension are as followed:

1. Chalk in water (milky suspension).
2. Paints.

(vii) Define aqueous solution. Also write one example.

Ans The solution, which is formed by dissolving a substance in water is called aqueous solution. In aqueous solutions, water is always present in greater amount and termed as solvent. For example, sugar in water and table salt in water.

(viii) What do you mean by volume / volume %? Also give one example.

Ans **Percentage - volume / volume (% v/v):**

It is the volume in cm^3 of a solute dissolved per 100 cm^3 of the solution. For example, 30 percent alcohol solution means 30 cm^3 of alcohol dissolved in sufficient amount of water, so the total volume of the solution becomes 100 cm^3.

$$\% \text{ by volume} = \frac{\text{Volume of solute } (cm^3)}{\text{Volume of solution } (cm^3)} \times 100$$

Q.4. Write short answers to any FIVE (5) questions: 10

(i) Why O_2 is necessary for rusting?

Ans Oxygen is necessary for rusting because the iron chemically reacts with oxygen. Hence iron oxide, the main cause of rusting, is formed.

(ii) Which solution is used as an electrolyte in Nelson's cell?

Ans Aqueous solution of NaCl called brine is used as an electrolyte in Nelson's cell.

(iii) Define Redox reactions.

Ans Chemical reactions in which the oxidation state of one or more substances changes are called oxidation-reduction or redox reactions.

(iv) What is salt bridge? What is its basic function?

Ans Salt bridge is a U-shaped glass tube. It consists of a saturated solution of strong light supported in a jelly-type material. The ends of the U tube are sealed with a porous material like a glass wool. The function of the salt bridge is

to keep the solutions of two half cells neutral by providing a pathway for migration of ions.

(v) What is meant by malleable and ductile metals?

Ans Malleable metals can be hammered into sheets, and ductile metals can be drawn into wires.

(vi) Write two uses of calcium.

Ans The important uses of calcium are as followed:

(i) It is used to remove sulphur from petroleum products.

(ii) It is used as reducing agent to produce Cr, U and Zr.

(vii) Why is HF a weak acid?

Ans Acid is a substance which gives out H^+ ions in aqueous solution. The hydrogen-fluorine bonding in HF is strong. Because of the high electronegativity of fluorine, there is extensive hydrogen bonding in HF. It takes tremendous amount of energy to break the strong H – F bond in water, so it only partially dissociates in water, making it a weak acid.

(viii) Write down chemical reaction of solution with H_2 and Cl_2.

Ans **(i) H_2:**

They form ionic hydrides with H_2 at high temperature.

$$2Na + H_2 \longrightarrow 2NaH$$

(ii) Cl_2:

They react violently with halogens at room temperature to give halides.

$$2Na + Cl_2 \longrightarrow 2NaCl$$

(Part-II)

NOTE: Attempt any TWO (2) questions.

Q.5.(a) Write down five results of experiment of Rutherford's atomic model. (5)

Ans Rutherford proposed planetary model for an atom and concluded following results:

(i) Since most of the particles passed through the foil un-deflected, therefore, most of the volume occupied by an atom is empty.

(ii) The deflection of a few particles proved that there is a 'center of positive charges' in an atom, which is called 'nucleus' of an atom.

(iii) The complete rebounce of a few particles show that the nucleus is very dense and hard.

(iv) Since a few particles were deflected it shows that the size of the nucleus is very small as compared to the total volume of an atom.

(v) The electrons revolve around the nucleus.

(b) Define element and explain the kinds of elements with examples. **(4)**

Ans **Element:**

It is a substance made up of same type of atoms, having same atomic number and it cannot be decomposed into simple substances by ordinary chemical means.

It means that each element is made up of unique type of atoms that have very specific properties.

Elements occur in nature in free or combined form. All the naturally occurring elements found in the world have different percentages in the earth's crust, oceans and atmosphere.

Kinds of elements:

Elements may be solids, liquids or gases. Majority of the elements exist as solids *e.g.*, sodium, copper, zinc, gold, etc. There are very few elements which occur in liquid state *e.g.*, mercury and bromine. A few elements exist as gases *e.g.*, nitrogen, oxygen, chlorine and hydrogen.

On the basis of their properties, elements are divided into metals, non-metals and metalloids. About 80 percent of the elements are metals.

The elements are represented by symbols, which are abbreviations for the name of elements. A symbol is taken from the name of that element in English, Latin, Greek or German. If it is one-letter, it will be capital as H for Hydrogen, N for Nitrogen, and C for Carbon, etc. In case of two-letter symbol, only first letter is capital *e.g.*, Ca for Calcium, Na for Sodium and *Cl* for Chlorine.

Q.6.(a) Define coordinate covalent bond and explain it with an example. (5)

Ans **Coordinate Covalent Bond:**

"It is a type of covalent bonding in which the bond pair of electrons is donated by one bonded atom only. The atom which donates the electron pair is called **donar** and the atom which accepts the electron pair is called **acceptor.**"

A small arrow is usually used to indicate the atom and pair of electron being donated. The head of arrow is towards the acceptor atom.

The non-bonded electron pair available on an atom, like the one available on nitrogen in ammonia, ($\ddot{N}H_3$) is called a lone pair. When a proton (H^+) approaches a molecule with a lone pair of electrons, that lone pair is donated to H^+ and a coordinate covalent bond is formed, *e.g.*, formation of ammonium radical (NH_4^+).

In the formation of BF_3 (boron trifluoride) molecule, three valence electrons of boron atom (Z = 5) pair up with three electrons, one from each three fluorine atoms. The boron atom even after this sharing of electrons (covalent

bond formation), remains short or deficit of two electrons in its outermost shell. Now if a molecule with a lone pair approaches this molecule, it accepts lone pair from that donor and forms a coordinate covalent bond.

(b) Write down any four typical properties of gases. (4)

Ans Typical Properties:

Gases have similar physical properties. A few typical properties are discussed here:

(i) Diffusion:

Gases can diffuse very rapidly. Diffusion is defined as "Spontaneous mixing up of molecules by random motion and collisions to form a homogeneous mixture." Rate of diffusion depends upon the molecular mass of the gases. Lighter gases diffuse rapidly than heavier ones. For example, H_2 diffuses four times faster than O_2 gas.

(ii) Effusion:

"It is escaping of gas molecules through a tiny hole into a space with lesser pressure." For example, when a tyre gets punctured, air effuses out. Effusion depends upon molecular masses, lighter gases effuse faster than heavier gases.

(iii) Compressibility:

Gases are highly compressible due to empty spaces between their molecules. When gases are compressed, the molecules come closer to one another and occupy less volume as compared to the volume in uncompressed state.

(iv) Mobility:

Gas molecules are always in state of continuous motion. They can move from one place to another because gas molecules possess very high kinetic energy. They move through empty spaces that are available for the molecules to move freely. This mobility or random motion results in mixing up of gas molecules to produce a homogeneous mixture.

Q.7.(a) Explain the manufacture of sodium metal from fused NaCl. (5)

Ans **Manufacture of Sodium Metal from Fused NaCl:**

On the industrial scale, molten sodium metal is obtained by the electrolysis of fused NaCl in the Down's cell. This electrolytic cell is a circular furnace. In the center, there is a large block of graphite, which acts as an anode while cathode around it is made of iron as shown in figure.

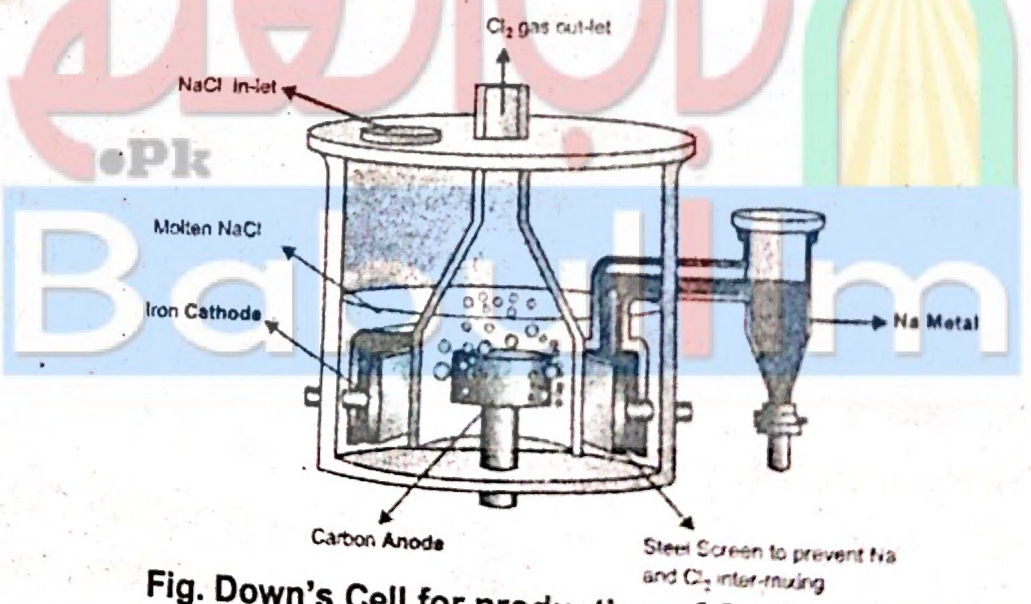

Fig. Down's Cell for production of Sodium Metal.

Working of Down's Cell:

The fused NaCl produces Na^+ and Cl^- ions, which migrate to their respective electrodes on the passage of electric current. The electrodes are separated by steel gauze to prevent the contact between the products. The

Cl^- ions are oxidized to give Cl_2 gas at the anode. It is collected over the anode within an inverted cone-shaped structure. While Na^+ are reduced at cathode and molten Na metal floats on the denser molten salt mixture from where it is collected in a side tube. Following reactions take place during the electrolysis of the molten sodium chloride:

Molten NaCl ionizes as;

$$2NaCl_{(s)} \rightleftharpoons 2Na^+_{(l)} + 2Cl^-_{(l)}$$

Half-cell reaction at anode (oxidation):

$$2Cl^-_{(l)} \longrightarrow Cl_{2(g)} + 2e^-$$

Half-cell reaction at cathode (reduction):

$$2Na^+_{(l)} + 2e^- \longrightarrow 2Na_{(l)}$$

Overall galvanic reaction is the sum of these two half-cell reactions.

$$2NaCl_{(fused)} \longrightarrow Cl_{2(g)} + 2Na_{(l)}$$

(b) Write any four characteristics of Colloid. (4)

Ans For Answer see Paper 2017 (Group-II), Q.7.(a).